

25. Construction Support

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25.1. Responsibilities

The Bridge Section is involved in support activities related to the construction of structural components on highway construction projects. The Engineer-of-Record (bridge designer) is usually responsible for these activities, in coordination with the construction project engineer (the Engineer).

The Engineer has the responsibility and authority for construction contract administration. As single point of contact, the Engineer will forward bridge-related construction questions, Requests for Information (RFIs), submittal reviews, and Design Clarification/Verification Requests (DCVRs) to the bridge designer. Respond to the Engineer as quickly as possible and within the timeframe specified in the contract documents.

All formal correspondence from the Bridge Section is sent to the Engineer and may be forwarded to the Contractor. The Contractor and Engineer must give written permission to the bridge designer to communicate directly with suppliers and fabricators to expedite review and approval of various submittals. Copy the Engineer and Contractor on all correspondence with suppliers and fabricators to keep them informed of the review and approval status.

25.2. Shop and Working Drawings

The Contractor is responsible for submitting working drawings and shop drawings to the Engineer for review. Contractors, suppliers, and fabricators sometimes request modifications to the structural designs to accommodate their methods. Typically, only the Engineer-of-Record is authorized to approve modifications to the structural design (12 AAC 36.195).

25.2.1. Definitions

The following definitions apply to this *Manual*:

Working Drawings: Drawings, diagrams, illustrations, samples, schedules, calculations, and other documents that illustrate the construction of the work, material, equipment, methods, and items necessary to construct the work according to the plans and specifications. The documents are prepared by the Contractor, and once approved, become a part of the contract.

Shop Drawings: Drawings prepared by the Contractor in greater detail than and supplemental to the plans showing dimensions, manufacturing conventions, and special fabrication instructions used to control the fabrication of portions of the final structure. Once approved, these documents become a part of the contract.

25.2.2. Procedures

The following procedures apply to the bridge designer's review of shop and working drawings.

Contractor Submittals

The DOT&PF *Standard Specifications for Highway Construction* provide general requirements for working drawing submittals and the procedures for their submission, review, and approval. The bridge designer will identify additional items of work requiring shop and working drawing submittals and reviews in the Special Provisions.

The *Standard Specifications* specify the number of submittal copies, but this may not be adequate for some projects. The Engineer, bridge designer, and Contractor require copies of the approved shop or working drawings. The supplier/fabricator, design consultant, Statewide Materials Engineer, and other involved entities may also need copies. Specify the number of required submittal copies in the Special Provisions if different from the *Standard Specifications*.

To expedite review, contractors commonly submit shop drawings and other submittals in an electronic format (e.g., PDF files, AutoCAD files). Until a formal Department-wide policy on electronic submittals is issued, the Bridge Section will accept, review and reply to electronic submittals. When direct correspondence with the fabricator or Contractor has been approved, copy the Engineer in all electronic correspondence.

Review

After review of shop drawings or working drawings, the bridge designer will take one of the following actions:

1. **No Corrections.** If everything is correct on the drawings, stamp "APPROVED" on drawings that require the designer's approval such as shop drawings, erection plans, etc. For drawings that do not require the designer's approval, note that the drawings were reviewed for conformance with the contract and recommend approval by the Engineer.
2. **Minor Corrections.** If only minor corrections are required, mark the corrections and stamp "APPROVED AS NOTED" on the drawings that require the designer's approval. For drawings that do not require the designer's approval, note that the drawings were reviewed for conformance with the contract, mark corrections in red, and recommend approval by the Engineer with corrections as noted. The Contractor will not be required to resubmit the plans for further review and approval.
3. **Major Corrections.** If the drawings contain major discrepancies and errors, stamp "RETURNED FOR CORRECTION" on drawings that require the designer's approval. For drawings that do not require the designer's approval, note that the drawings were reviewed for conformance with the contract and they do not meet these requirements, and recommend that the Engineer return them to the Contractor for correction. The Contractor must revise and resubmit the drawings to DOT&PF with the corrections clearly noted.

On consultant-designed projects, the consultant is responsible for reviewing the shop and working drawings, determining their acceptability, and placing the applicable stamp on the drawings as indicated above. If requested by the Engineer, the Bridge Section will independently review the drawings and

convey any suggestions to the consultant for inclusion. The Bridge Section will stamp “REVIEWED” on the drawings. The Bridge Section’s review is usually concurrent with the consultant’s review.

The State Traffic and Safety Engineer and Bridge Section are both responsible for required sign and signal working drawings. Traffic and Safety reviews these submittals for conformance with layout and electrical requirements; the Bridge Section reviews the structural details.

Review Periods

The *Alaska Standard Specifications* require the Contactor to allow time for review and correction of submittals to the Department. The bridge designer typically makes shop and working drawing review a top priority after receiving the documents. Although the contract documents typically allow 30 days for review, most shop drawings should be reviewed and returned within five working days. In some circumstances, the review will need to be further accelerated.

25.2.3. Checklists

Appendix 25A presents standardized shop drawing and working drawing checklists. These checklists are not necessarily consistent with the contract provisions for every project. Complete the checklists applicable to the project.

25.3. Construction Field and Shop Inspections

The Engineer may ask the bridge designer to conduct field and shop inspections during construction. The designer has a unique perspective and knowledge of the structure design, which can help ensure that construction problems are avoided. Therefore, the designer must be responsive when asked to participate in construction inspection related to structural elements.

Responsibilities

The *Alaska Construction Manual* describes the responsibilities of the various DOT&PF units for construction inspections of structural items.

Field Inspections

The Engineer may request that the bridge designer participate in the following field activities:

- attend pre- and post-construction meetings
- attend pre-concreting conferences ahead of planned concrete placement operations
- observe concrete placement
- for cast-in-place structures supported by falsework, observe the construction operation at some point during falsework construction or before the concrete placement is started
- participate in a close-out or “punch list” inspection. The initial inventory inspection required by the National Bridge Inspection Standards (NBIS) can be combined with this close-out inspection.

25.4. Construction Change Orders

The bridge designer should review change orders related to structural items. The objectives of the review are to:

- determine structural adequacy, consistency with design intent, and consistency with other structural details and specifications;
- calculate and verify the quantities and costs; and
- seal the change order according to Section 13.6 of the *Alaska Construction Manual*.

25.5. Value Engineering Proposals

The *Alaska Standard Specifications* allow Contractors to submit Value Engineering Proposals (VEPs) to modify the plans, specifications, or other requirements in the contract to reduce the total cost of construction without reducing design capacity or quality of the finished product. The *Alaska Standard Specifications* present the procedures that a contractor must follow for a VEP, which is processed as a change order.

25.5.1. Bridge Section Review

The Engineer will seek input from the Bridge Section for any VEP related to structural items. In general, the bridge designer who reviews the VEP must recognize that the contract documents represent one solution to accomplishing the project objectives. For a variety of reasons (e.g., equipment, specialized contractor expertise, field conditions), this solution may not be the most economical. In reviewing the proposal, ensure that the proposed structure is at least equal to the safety, functionality, durability, and longevity of the design presented in the contract documents. Comments on deficiencies in the VEP should be specific and as factual as possible.

25.6. Requests for Information

During the advertising period, prospective bidders may submit Requests for Information (RFIs) to DOT&PF. If related to structural items, these RFIs will be forwarded to the Bridge Section for a response.

Transmit the response through the proper authority in the regional office to ensure consistent responses to all potential bidders. Never directly respond or otherwise contact the bidder.

If changes to the contract documents are necessary, coordinate with the Design Project Manager and Regional Contracts Office to initiate an addendum to the contract documents.

During construction, the Engineer may submit Design Clarification/Verification Requests (DCVRs) to the Bridge Section. Respond to these as soon as possible. If the response is verbal, prepare a Record of Conversation and send a copy to the Engineer for confirmation.

25.7. Materials Certification List (MCL)

During the design phase, the Bridge Section provides a list of material items that require review prior to approval and incorporation into the work during

construction. These items include concrete mix designs, reinforcing steel mill certifications, reinforcing steel mechanical splice test reports, elastomeric bearing pad test reports, structural steel mill certifications, and similar documents.

When requested, provide a project-specific MCL to the Design Project Manager for incorporation into the contract documents. The Engineer uses the MCL to identify who (e.g., Bridge, Statewide Materials, Regional QA Engineer) will review and approve Contractor submittals.

Appendix 25.A

SHOP DRAWING CHECKLISTS

Appendix 25.A presents the following standardized checklists for each of the following most common shop drawings:

- precast, pre-tensioned concrete girders
- precast concrete members
- structural steel
- reinforcing bar drawings
- bearings
- expansion joints
- bridge railing

The bridge designer must verify compliance with the shop drawing requirements as specified in the *Alaska Standard Specifications* and contract Special Provisions.

Contract No. _____

Date: _____

Bridge No. _____

Designer(s): _____

PRECAST, PRE-TENSIONED CONCRETE GIRDERS

Are the following items properly included on the shop drawings for precast, pre-tensioned concrete girders?	Yes	No	N/A
1. All dimensions including total length of girder adjusted to accommodate roadway profile grade and elastic shortening.	☐	☐	☐
2. The number and size of all members.	☐	☐	☐
3. The number, size, and type of prestressing strands, their locations, and the forces in these prestressing elements.	☐	☐	☐
4. Girder end details, including size of blockouts, location, and diameter of holes or inserts, and embedded bearing plates.	☐	☐	☐
5. The location and details of lifting devices and support points if the girder will not rest on its bearings while being stored or transported.	☐	☐	☐
6. The location and type of any inserts required for rail posts, utilities, and other attachments. Verify that correct coating is noted.	☐	☐	☐
7. The layout of the casting bed to be used for casting the prestressed girders showing the location of hold-down devices for any harped strands.	☐	☐	☐
8. Methods for providing and controlling required girder camber during casting, transport, and erection.	☐	☐	☐
9. The location and length of any de-bonded prestressing strands.	☐	☐	☐
10. Jacking forces and number of strands.	☐	☐	☐
11. Path of straight and harped strands, including deflecting saddles (details and required number).	☐	☐	☐
12. The details and type of reinforcing steel including bar size, number per girder, total number, length each, total length, total weight, bent bar, bar coating, minimum lap for size of bar used, and grade of bar used.	☐	☐	☐
13. All general notes and construction notes presented in the contract plans reflected in the shop drawings.	☐	☐	☐
14. Concrete compressive strength at release and at 28 days.	☐	☐	☐

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Bridge No. _____

Designer(s): _____

PRECAST CONCRETE MEMBERS

Are the following items properly included on the shop drawings for precast concrete members?	Yes	No	N/A
1. All dimensions.	☐	☐	☐
2. The number and size of all members.	☐	☐	☐
3. Reinforcing materials, sizes, dimensions, orientation, and minimum concrete cover.	☐	☐	☐
4. Concrete 28-day compressive strength and mix design identification number.	☐	☐	☐
5. Joint details and materials.	☐	☐	☐
6. All general notes and construction notes presented in the contract plans reflected in the shop drawings.	☐	☐	☐

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Date: _____

Bridge No. _____

Designer(s): _____

STRUCTURAL STEEL

Are the following items properly included on the shop drawings for structural steel?	Yes	No	N/A
1. Principal controlling dimensions and materials.			
a. Length of span adjusted to accommodate roadway profile grade.	☐	☐	☐
b. Length, thickness, and width of plates in primary members and splices.	☐	☐	☐
c. Primary dimensions and/or weight per length of rolled shapes.	☐	☐	☐
d. Diameter, specification, and grade of mechanical fasteners and coating on faying surfaces, if required.	☐	☐	☐
e. Specification, grade, and toughness testing requirements for steel components.	☐	☐	☐
f. Size of fillet welds and partial joint penetration welds; appropriate partial and complete joint penetration weld configurations.	☐	☐	☐
2. Web and flange plates of welded plate girders and rolled beams.			
a. Weld designations.	☐	☐	☐
b. Shop groove weld splice locations.	☐	☐	☐
c. Flange and web tapers and haunches (controlling dimensions only).	☐	☐	☐
d. Location of tension zones in welded members.	☐	☐	☐
3. Stiffener and connection plates.			
a. Width, thickness, material grade, and if toughness testing required.	☐	☐	☐

Are the following items properly included on the shop drawings for structural steel?		Yes	No	N/A
b.	Weld size and termination details and bolting to web and flange details.	☐	☐	☐
c.	Spacing of intermediate stiffeners.	☐	☐	☐
d.	Avoiding interference with shop web and flange splice locations.	☐	☐	☐
e.	Fit and location of stiffeners.	☐	☐	☐
f.	Bolt hole edge distances and compatibility with diaphragm/cross-frame connections.	☐	☐	☐
4.	Bolted splices.			
a.	Flange and web splice plate thickness and dimensions.	☐	☐	☐
b.	Number, size, and spacing of bolts and holes in splice material.	☐	☐	☐
c.	Bolt hole edge distances.	☐	☐	☐
d.	Fill plates if necessary.	☐	☐	☐
5.	Cross-frames and diaphragms.			
a.	Member dimensions and orientation.	☐	☐	☐
b.	Number and spacing of connection plate bolts and types of holes, especially for slip-critical connections or details required for differential deflections, especially for horizontally curved members.	☐	☐	☐
c.	Size, designation and length of welded connections. Weld termination details.	☐	☐	☐
6.	Camber and/or mid-ordinate for cambered rolled beams or welded plate girder sections.	☐	☐	☐
7.	Procedures and sequence for shop assembly including handling methods.	☐	☐	☐

Are the following items properly included on the shop drawings for structural steel?		Yes	No	N/A
8.	Number and spacing of bolts in floor girder and cross girder connections and special attachments (e.g., brackets).	☐	☐	☐
9.	Notes and details relative to cleaning and coating.			
a.	Corner preparation (if required for cut edges).	☐	☐	☐
b.	Cleaning, required surface preparation, and profile depth (if specified).	☐	☐	☐
c.	Shop primer: type; manufacturer; wet or dry film thickness; verification of cure before shop application of subsequent coatings; applicable restrictions on field contact (faying) surfaces; any requirements for pre-priming shop contact surfaces before assembly; and designation of any field weld areas to be left unprimed.	☐	☐	☐
d.	Field and top coat(s); shop or field; type; manufacturer; wet or dry film thickness; intermediate coat cure times and/or recoating “window” (time) specified by the contract documents or paint manufacturer’s data sheet; any blockout areas where shop top coats are not permitted (e.g., field splices, diaphragm/cross-frame connections, bearings).	☐	☐	☐
10.	Designation of material, tension zones, and welds for fracture-critical members (FCMs).	☐	☐	☐
11.	Material designation.	☐	☐	☐
12.	Incorporation of all necessary revisions into the shop drawings. (<i>Significant change may require a change order.</i>)			
a.	Errors or discrepancies in the contract plans discovered during shop drawing preparation or review.	☐	☐	☐
b.	All construction changes that affect the shop drawings.	☐	☐	☐
c.	Fabricator-proposed modifications approved by DOT&PF and contractor.	☐	☐	☐
d.	Proposed material substitutions.	☐	☐	☐
13.	Framing plan details.			

Are the following items properly included on the shop drawings for structural steel?	Yes	No	N/A
a. Basic span lengths and, where appropriate, transverse girder spacing.	☐	☐	☐
b. Pier and abutment identifications.	☐	☐	☐
c. Orientation of structure (north arrow), skew(s), spot checks of curve or flare geometry, if applicable.	☐	☐	☐
d. Piecemarks indicated for every element, and their relative location is shown to clarify member orientation.	☐	☐	☐
14. Verification of fabricator certification.	☐	☐	☐
15. Compliance with project-specific requirements that may supersede the requirements of this checklist (such as utility attachments, special connections or connection materials, and stage removal and construction).	☐	☐	☐

Contract No. _____

Date: _____

Bridge No. _____

Designer(s): _____

REINFORCING BAR DRAWINGS

Are the following items properly included on the shop drawings for reinforcing bar drawings?	Yes	No	N/A
1. For each reinforced concrete component, a bar schedule including bar mark, quantity, total length, bar type, and bend details for each representative bar.	☐	☐	☐
2. Representative drawing of each bar type showing variable bend detail dimensions.	☐	☐	☐
3. Drawings of the component detailing the location and orientation of each bar.	☐	☐	☐
4. Material designation for all bars and coatings.	☐	☐	☐

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Designer(s): _____

BEARINGS

Are the following items properly included on the shop drawings for bearings?	Yes	No	N/A
1. Location diagram showing the general layout of the structure with the locations and orientation of the bearings.	☐	☐	☐
2. The number, size, and types of all bearings.	☐	☐	☐
3. Plan and elevation views of bearings showing dimensions, tolerances, and fabrication details; details of all components.	☐	☐	☐
4. Bearing fabrication and assembly details; welding details.	☐	☐	☐
5. Material designations and testing requirements are noted.	☐	☐	☐
6. Steel surface preparation and shop coating details.	☐	☐	☐
7. Design calculations conforming to contract documents, if necessary.	☐	☐	☐

Contract No. _____

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Bridge No. _____

Designer (s): _____

EXPANSION JOINTS

Are the following items properly included on the shop drawings for expansion joints?	Yes	No	N/A
1. General layout and dimensions (overall length, skew angle). Orientation of expansion joint components within the joint blockout.	☐	☐	☐
2. The number, size (movement rating), and types of all expansion joints.	☐	☐	☐
3. Plan and elevation views and sections for all components.	☐	☐	☐
4. Material designations for all components; coatings.	☐	☐	☐
5. Installation widths (minimum and maximum) noted including provisions for temperature variations.	☐	☐	☐
6. Manufacturer recommendations for installation methods and procedures. Required attendance of manufacturer's technical representative noted, if applicable.	☐	☐	☐
7. Where applicable, strip seal glands or joint fillers are provided as one continuous piece. Details for method of splicing glands or joint fillers for non-continuous installations.	☐	☐	☐
8. Details for shop and field welding of steel joint components.	☐	☐	☐
9. Supplementary items for modular expansion joints.			
a. Installation sequence and procedures, lifting locations and mechanisms, leveling assemblies details, adjustments for temperature changes, temporary and permanent anchorage to bridges, and shipping and storage requirements.	☐	☐	☐
b. Maintenance plan, parts list, parts replacement schedule, and inspection instructions.	☐	☐	☐
c. Design calculations and fatigue testing conforming to contract documents.	☐	☐	☐

Contract No. _____

Date: _____

Bridge No. _____

Designer(s): _____

BRIDGE RAILING

Are the following items properly included on the shop drawings for bridge railing?	Yes	No	N/A
1. General layout and dimensions.	☐	☐	☐
2. The number, size, and type for all bridge railings.	☐	☐	☐
3. Material designations for all components; coatings.	☐	☐	☐
4. All applicable dimensioned details with number required			
a. Rail splice details.	☐	☐	☐
b. Post details.	☐	☐	☐
c. Rail cap details.	☐	☐	☐
d. Anchor plate details.	☐	☐	☐
e. Base plate details.	☐	☐	☐
f. Transition connection plate detail.	☐	☐	☐

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